Response to Office Action Mailed February 3, 2010

A. Claims in the Case

Claims 1-20 and 29-33 have been rejected. Claims 1 and 7-8 have been amended. Claims 1-20 and 29-33 are pending in the case.

B. Specification

The specification has been objected to for several informalities. Applicant submits that the specification has been amended to address these formalities without the addition of new matter.

C. The Claims Define the Invention Pursuant To 35 U.S.C. § 112, Second Paragraph

Claim 8 was rejected under 35 U.S.C. § 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which Applicant regards as his invention.

Claim 8 has been amended for clarification.

D. The Claims Are Not Anticipated By Moriceau et al. Pursuant To 35 U.S.C. § 102(b)

The Examiner has rejected claims 1-4, 7-8, 12, 14, 18, 20, 31, and 33 under 35 U.S.C § 102(b) as being anticipated by International Patent Publication No. WO 99/35674 to Moriceau et al. ("Moriceau"). Applicant notes that U.S. Patent No. 6,756,286 has been used as an English Language Equivalent. Applicant respectfully disagrees with this rejection.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. Of California,* 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as contained in the ... claim." *Richardson v. Suzuki Motor Co.,* 868 F.2d 1226, 1236, 89 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim.

Applicant respectfully submits that Moriceau at least fails to teach all of the features of Applicant's claims.

Claim 1

Applicant's claim 1 states:

A method for fabricating a structure in the form of a plate, the method comprising:

depositing at least one intermediate layer on a substrate, the intermediate layer comprising at least one base material having distributed therein atoms or molecules termed extrinsic atoms or molecules which differ from the atoms or molecules of the base material,

wherein the intermediate layer is selected such that if a heat treatment is applied, the intermediate layer can become plastically deformable and the presence of the selected extrinsic atoms or molecules in the selected base material can cause the formation of mirco-bubbles or micro-cavities in the intermediate layer;

bonding a superstrate to the intermediate layer; and

applying a heat treatment to the structure, in the temperature range of said heat treatment, whereby the intermediate layer is rendered plastically deformable and micro-bubbles are formed therein.

Support for the recited combination of features can be found in Applicant's specification, which states:

> One embodiment concerns a method for fabricating a structure in the form of a plate including at least one substrate, a superstrate and at least one intermediate layer interposed between the substrate and the superstrate.
>
> According to an embodiment, the method includes selecting an intermediate layer including at least one base material having distributed therein atoms or molecules termed extrinsic atoms or molecules which differ from the atoms or molecules of the base material, and applying a heat treatment to said structure so that, in the temperature range of said heat treatment, the intermediate layer is plastically deformable, and the presence of the selected extrinsic atoms or molecules in the selected base material causes the irreversible formation of micro-bubbles or micro-cavities in the intermediate layer.
> (Substitute Specification; Page 2, Lines 6-16)
> .....
> Fig. 1 shows a structure 1 in the form of a plate which, for example, has a diameter of about two hundred millimeters.
>
> This structure includes a substrate 2 in the form of a wafer, a superstrate 3 in the form of a wafer and an intermediate layer 4 interposed between the substrate 2 and the superstrate 3.
>
> In general, the intermediate layer 4 is formed from at least one base material having distributed therein atoms or molecules termed extrinsic atoms or molecules which differ from the atoms or molecules of the base material, and has a composition such that, when a suitable heat treatment is applied to the structure 1, micro-bubbles or micro-cavities, in particular of a gaseous phase, are irreversibly formed such that said intermediate layer 4 transforms to become spongy and, as a correlation, it is likely to increase in thickness.
> (Substitute Specification; Page 8, Lines 3-15)

The Office Action appears to rely solely on the disclosure of Moriceau to teach each of the combined features of Applicant's claims. For example, the Office Action states:

> As to claims 1-3, 31, and 33, Moriceau teaches in a method for transferring a thin film: forming a layer of inclusions in an initial substrate at a depth corresponding to the required thickness of the film (abstract)... In one example for obtaining an SOI structure,

> on an initial substrate 31, a silicon film 32 (an intermediate layer), strongly doped with boron (extrinsic) atoms, is produced by epitaxy (column 12 lines 40-45, column 5 lines 10-12, figure 7). The substrate is then coated with an oxide film 34 (column 12 lines 45-50). The substrate is then submitted to gaseous compound implantation (column 12 lines 51-54). The surface 35 of the substrate is bonded by (molecular) wafer bonding to a silicon plate (a superstrate) (column 12 lines 55-57). Heat treatment is then performed to separate the structure 30 into two parts by means of a fracture at the inclusions zone in film 32 (column 12 lines 58-64). The presence of the (extrinsic) boron atoms implicitly causes the formation of micro-cavities (column 5 lines 20-21 and 30-33)...
> (Office Action; Pages 3-4)

By asserting that "[t]he presence of the (extrinsic) boron atoms implicitly causes the formation of micro-cavities," the Office Action appears to concede that Moriceau does not explicitly teach all of the features of Applicant's claims. "It is well settled that a prior art reference may anticipate when the claim limitations not expressly found in that reference are nonetheless inherent in it. Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes, the claimed limitations, it anticipates." *In re Cruciferous Sprout Litig.,* 301 F.3d 1343, 1349 (Fed. Cir. 2002). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson,* 169 F.3d 743, 745 (Fed. Cir. 1999) (see MPEP 2112).

Moriceau is directed to "[a] process for transfer of at least one thin film of a solid material delimited in an initial substrate" (Moriceau; Abstract). As cited by the Office Action, Moriceau teaches:

> FIG. 7 illustrates an application of the process according to the invention when an SOI structure is obtained. The initial substrate 30 is formed starting from a silicon platelet 31 on a face on which a silicon film 32 about 50 nm thick is deposited, strongly doped

(about 1019 atoms/cm^3) by boron produced by epitaxy. The film 32 is itself covered with a silicon film 33 about 350 nm thick, slightly doped (about 5.1015 atoms/cm^3) by boron and also produced by epitaxy. Finally, the film 33 is coated with an SIO_2 film 34 about 400 nm thick and with a free surface 35. The highly doped silicon film 32 will act as the inclusions zone.
The substrate 30 is then submitted to the gaseous compound implantation step through surface 35. Hydrogen is implanted at a dose of 5.1016 atoms/cm_2, at an energy of 80 keV and at ambient temperature.
The surface 35 is then made to bond to a silicon plate by wafer bonding reinforced by heat treatment at 250°C for 30 minutes.
The step in which the initial of substrate 30 is separated into two parts comprises a heat treatment, the efficiency of the heat treatment with respect to the fracture being adapted by the thermal budget (duration and temperature of the various heat inputs). This final heat treatment induces a fracture in the initial substrate, at and/or close to the film 32. The final heat treatment may typically be 2 hours at 250°C.
It is thus possible to obtain a structure formed of a slightly doped silicon film (film 33 in the initial substrate) on a silicon oxide layer (film 34 in the initial substrate), which is attached to a silicon mass. The highly doped silicon film 32 was used for confinement of the fracture.
(Moriceau; Col. 12, Line 40 to Col. 13, Line 2)

Applicant respectfully submits that the teachings of Moriceau do not appear to make clear that the Boron atoms cause the formation of micro-cavities. For example, Applicant notes that both films 32 and 33 are doped by boron, however, it appears that micro-cavities are only formed in film 32.

Furthermore, Moriceau goes on to teach:

The improvement proposed by this invention is made possible due to creation of an inclusion or a set 6f inclusions in the initial substrate material, in order to confine gaseous compounds introduced during the ion implantation step. An inclusion is a volume of material for which the properties are not the same as the properties of the substrate material from which one or more thin films are to be transferred. Inclusions may be in the form of a layer that extends approximately parallel to the surface through which the implantation is done. These volumes may have a variety of shapes and their dimensions may vary from a few tens of nanometers to several hundreds of micrometers. The role of

these inclusions is to act as traps for implanted gaseous compounds. The radius of action of these traps depends on the nature of the inclusions made. In this case, there is no removed material, as is the case for the process divulged by document EP-A-0 767 486.

The process according to this invention comprises a preliminary step that consists of forming inclusions in the initial substrate material. A subsequent step consists of implanting gaseous compounds (rare gas or other) in this material. The presence of inclusions formed during the previous step causes confinement of implanted gaseous compounds. The efficiency of these inclusions is related to their power to confine gaseous compounds.
(Moriceau; Col. 2, Lines 21-46)

.....

Therefore, the purpose of the invention is a process for the transfer of at least one thin film of solid material delimited in an initial substrate, characterized in that it comprises the following steps:

a step in which a layer of inclusions is formed in the initial substrate at a depth corresponding to the required thickness of the thin film, these inclusions being designed to form traps for gaseous compounds which will subsequently be implanted;

a subsequent step for implantation of the said gaseous compounds, in a manner to convey the gaseous compounds into the layer of inclusions, the dose of implanted gaseous compounds being sufficient to cause the formation of micro-cavities likely to form a fracture plane along which the thin film can be separated from the remainder of the substrate.

(Moriceau; Col. 3, Lines 1-16)

It seems clear from the excerpts recited above that, according to the teachings of Moriceau, the presence of "implanted gaseous compounds" causes the formation of micro-cavities, not the Boron atoms. As such, it appears that Moriceau at least fails to implicitly or explicitly teach the features of, "wherein the intermediate layer is selected such that if a heat treatment is applied, the intermediate layer can become plastically deformable and the presence of the selected extrinsic atoms or molecules in the selected base material can cause the formation of mirco-bubbles or micro-cavities in the intermediate layer," in combination with the other features of Applicant's claims.

Claim 7

Applicant's claim 7 states:

A method for fabricating a silicon wafer, comprising:

depositing at least one dielectric intermediate layer on a substrate formed from silicon, the dielectric intermediate layer comprising at least one base material having distributed therein atoms or molecules termed extrinsic atoms or molecules which differ from the atoms or molecules of the base material;

wherein the intermediate layer is selected such that if a heat treatment is applied, the intermediate layer can become plastically deformable and the presence of the selected extrinsic atoms or molecules in the selected base material can cause the formation of mirco-bubbles or micro-cavities in the intermediate layer;

bonding a superstrate to the intermediate layer; and

applying a heat treatment to the wafer, in the temperature range of the heat treatment, whereby the intermediate layer is rendered plastically deformable and micro-bubbles are formed therein.

Therefore, for at least the reasons recited above, Applicant submits that Moriceau at least fails to implicitly or explicitly teach the features of, "wherein the intermediate layer is selected such that if a heat treatment is applied, the intermediate layer can become plastically deformable and the presence of the selected extrinsic atoms or molecules in the selected base material can cause the formation of mirco-bubbles or micro-cavities in the intermediate layer," in combination with the other features of Applicant's claims.

E. The Claims Are Not Obvious Over The Cited Art Pursuant To 35 U.S.C. § 103(a)

The Examiner has rejected claims 5, 8, 9, 15-17, 19, 29-30, and 32 as being unpatentable over International Patent Publication No. WO 99/35674 to Moriceau et al. ("Moriceau"), as

applied to claims 1-4, 7-8, 12, 14, 18, 20, 31, and 33 above, in view of U.S. Patent No. 6,417,075 to Harberger et al. ("Harberger"). Applicant notes that U.S. Patent No. 6,756,286 has been used as an English Language Equivalent for Moriceau. Applicant respectfully disagrees with this rejection.

In order to reject a claim as obvious, the Examiner has the burden of establishing a *prima facie* case of obviousness. *In re Warner et al.,* 379 F.2d 1011, 154 USPQ 173, 177-178 (CCPA 1967). To establish a *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ. 580 (CCPA 1974), MPEP § 2143.03. Moreover, in an obviousness determination, it is important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the manner claimed. *Takeda chemical v. Alphapharm*, 492 F.3d 1350, 1356-57 (Fed. Cir. June 28, 2007) (citing *KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1731 (2007)).

Applicant notes that the teachings of Moriceau have been applied to claims 5, 8, 9, 15-17, 19, 29-30, and 32 as they were in relation to claims 1-4, 7-8, 12, 14, 18, 20, 31, and 33. Therefore for at least the reasons recited above, Applicant submits that Moriceau at least fails to teach or suggest the features of, "wherein the intermediate layer is selected such that if a heat treatment is applied, the intermediate layer can become plastically deformable and the presence of the selected extrinsic atoms or molecules in the selected base material can cause the formation of mirco-bubbles or micro-cavities in the intermediate layer," in combination with the other features of Applicant's claims.

F. <u>The Claims Are Not Obvious Over The Cited Art Pursuant To 35 U.S.C. § 103(a)</u>

The Examiner has rejected claims 6 and 10 as being unpatentable over International Patent Publication No. WO 99/35674 to Moriceau et al. ("Moriceau"), as applied to claims 1-4, 7-8, 12,

14, 18, 20, 31, and 33 above. Applicant notes that U.S. Patent No. 6,756,286 has been used as an English Language Equivalent for Moriceau. Applicant respectfully disagrees with this rejection.

For at least the reasons recited above, Applicant submits that claims 6 and 10 are patentable over Moriceau.

G. The Claims Are Not Obvious Over The Cited Art Pursuant To 35 U.S.C. § 103(a)

The Examiner has rejected claim 11 as being unpatentable over International Patent Publication No. WO 99/35674 to Moriceau et al. ("Moriceau"), as applied to claims 1-4, 7-8, 12, 14, 18, 20, 31, and 33 above, in view of U.S. Patent No. 6,303,468 to Aspar et al. ("Aspar").

The Office Action does not appear to present the teachings of Aspar as a remedy to the deficiencies of Moriceau discussed above. Thus, for at least those reasons, Applicant submits that claim 11 is patentable over Moriceau alone, or in hypothetical combination with Aspar.

H. The Claims Are Not Obvious Over The Cited Art Pursuant To 35 U.S.C. § 103(a)

The Examiner has rejected claim 13 as being unpatentable over International Patent Publication No. WO 99/35674 to Moriceau et al. ("Moriceau"), as applied to claims 1-4, 7-8, 12, 14, 18, 20, 31, and 33 above, in view of U.S. Patent No. 4,979,015 to Stierman et al. ("Stierman").

The Office Action does not appear to present the teachings of Stierman as a remedy to the deficiencies of Moriceau discussed above. Thus, for at least those reasons, Applicant submits that claim 13 is patentable over Moriceau alone, or in hypothetical combination with Stierman.

I. Summary

For at least the reasons cited above, Applicant submits that all claims are in condition for allowance. Favorable reconsideration is respectfully requested.

If any extension of time is required, Applicant hereby requests the appropriate extension of time. If any fees are inadvertently omitted or if any additional fees are required or have been overpaid, please appropriately charge or credit those fees to Meyertons, Hood, Kivlin, Kowert & Goetzel, P.C. Deposit Account Number 50-1505/5310-09500/EBM

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